Basics of the Biolase Millennium Hydrokinetic (HKS) Hard/Soft Tissue Laser and Clinical Cases

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The Biolase Millennium is an Erbium, Chromium, Yttrium, Scandium, Galium, Garnet (ER,CR:YSGG) laser that produces energy at a wavelength of 2780 nanometers (nm), which is infrared and thus invisible. In this article, laser 'jargon' will be added in parentheses. The unit is FDA approved for both hard & soft tissue applications. The crystal array is activated (pumped) by photo flash lamps; the resulting photons are delivered via a fiber bundle to a swiveling 90 degree handpiece with removable tips similar to dental burs. An air/water mist is sprayed around the tip. The photons interact and explode the water droplets, energizing them and propelling them into tooth structure, breaking down the crystalline structure and removing enamel and underlying carious dentin. It literally cuts with energized H20! This wavelength has a very strong affinity for water.

Power is variable from .25 to 6 Watts, with 4 presets that are adjustable by the operator. Higher power is used on enamel, carious dentin is usually removed at a range of 3 to 3.5 Watts. The 400 micron tapered tips are used at powers at or below 3 watts. For soft tissue applications, the H20 is turned off and air only is used for tissue cooling. In contact with tissue, the tip cuts (ablates) very rapidly at 1 to 1.5 watts with excellent hemostasis in healthy tissue. There is no tissue char, and very little fumes produced (plume). When used withdrawn from tissue (non-contact) it can be used for laser induced topical anesthesia at low powers, and also for hemostasis.

Several concerns seem to surface with hard tissue lasers. 1) The laser produces heat, which is damaging to the pulp. The opposite is true! In vitro testing shows that pulpal tissue is at the same or slightly lower temperature when using the Millennium. 2) The laser energy somehow damages pulpal tissue. In vivo histological pulpal evaluation has shown no tissue response immediately post-op or at 8 days post-op. Clinical experience indicates it is very gentle to pulpal tissue in exposures and deep caries. 3) It produces a fused enamel surface poor for bonding. Au contraire! The hydraulic HKS effect produces a frosty, irregular etched enamel surface that is wonderful for bonding; we have started extending the margins a bit to create a 'halo' effect which helps margins virtually disappear. The esthetic advantage is a real bonus.

Millennium Advantages

1) Ability to do an almost surprising number of preps without anesthesia. Bill Greider of Fort Myers FL, who has the most experience in the U.S. of A., has documented close to 94% without injectables. My experience is close to this.

2) The esthetic/bonding advantage. Due to the 'frosty' stippled enamel surfaces produced, margins virtually disappear. Bonding is proving to be quite tenacious as well.

3) The Millennium is a triple win. Patients, staff and provider become enthused about this modality! Patients are often responsible for enthusiastic referrals; the best word of mouth possible.

4) The highest standard of care possible. Probably the most gentle modality to pulpal tissue extant

5) Very productive. The ability to prep multiple lesions in various quadrants is remarkable. The Millennium removes soft caries that air abrasion won't touch. This unit easily pays for itself. If you work 20 days a month, the lease payment is about $45 per day. The lease is usually taken care of in the first week of the month.

6)Vibration Free: Using a vibration free technology makes you aware of what an advantage this is over rotary instrumentation. Patients notice and appreciate the difference. "That's instead of the drill? Fantastic!"

7) Improved sense of professional and personal well being. This is worth more than you can imagine!

8) Both hard and soft tissue uses. With the recently introduced removable tips, this is a competent soft tissue laser. The Er:Yag lasers (Premier Centauri and Con-Bio Delite) are very limited in soft tissue applications.

For Those With Air Abrasion; AA has been with us since 2/96. The advantages of the Millennium in our experience are these:

1) Ability to remove remove soft or leathery decay AA won't touch. This is AA on steroids.

2) Less discomfort for patients. On more than a few occasions, we have chased caries into pulpal tissue with no anesthesia. Since the laser reduces bacteria counts dramatically & has minimal penetration into pulpal tissue, it is the least traumatic modality in existence, period. We can do far more comfortably with the laser.

3) Eliminates powder mess in the oral cavity and the environment.

4) Provides a more tenacious bond and better esthetics.

Clinical Cases

Case 1: Frenectomy, female age 54. Low frenum pull between 12 & 13. Very apprehensive. The Millennium was used for topical anesthesia at .25 watt defocused about 2 to 3 mm. The area is 'painted' for about 40 seconds. 1/2 carpule of 1/100 2% Xylocaine was infiltrated into the buccal vestibule. Patient was unaware of the injection. The laser was used at 1.25 watts with a tapered tip with air only in contact. The procedure is very fast; plume (smoke), char, and blood free. A 2 cm. wide area is usually cut to eliminate any tension or 'pull' as you lift the lip. The laser novice is amazed that this patient can be sent home with an area this wide unsutured or packed. These patients usually do very well with OTC nsaid pain control, some take nothing at all! Healing takes about two to three weeks due to the extent of the area involved. Fibromas are easier to remove because of the much smaller area involved, and heal rapidly. Biolase has a video (ask for video # 2) showing Dr. Bill Greider removing a fibroma using only topical!

Case 2: Female age 61. Presents with cracks on the facial of # 8 and an incisal 'divot' on 25. 3 radiating cracks on #8, probably from a trauma point years ago. It was beginning to stain and bother her. Laser at 4 watts, air & H20. Transferred from hygiene just before lunch. Cracks are rapidly prepped, not to dentin in this case. Incisal divot in 25 also prepped. No anesthesia. Preps are etched, prime & bond placed, micro hybrid resin applied (Vivadent Teric Ceram), voila, you're done! Restorations are undetectable. Patient is pleased and amazed. Tx. Time: <15 minutes.

Case 3: Male age 44. Presents with multiple deep cervical abfraction/erosions. Unrestored by previous dentist. Beginning to bother him: "Food packs in these, makes me think I'm going to lose these teeth." Facial gingivals of #'s 3,4,5, & 6 prepped with 3.5 watts initially, reduced to 3 watts as we placed retention divots at the mesial and distal of each prep. No anesthesia. Very slight patient awareness. These were at least 1.5mm deep and getting cranky to air, etc. "Do you think we should have numbed these, Jim? No way, Doc, I hardly even felt them." He really appreciated not being 'frozen'. Hard to do with air abrasion. Happy patient, pleased staff, very productive visit. We have begun to evaluate occlusal stresses in these deep cervical erosion cases; some think it is a causal factor. He has referred his wife and 3 kids. "My wife and kids need to come to you." This is not unique. Patients love the Millennium.

We have done two dozen or more pulp exposures and very deep caries in the last year. Only one of these cases (extensive and deep caries) has been endoed. We have done some unusual pulpal procedures and these are still vital. One case involved the anesthesia of and removal of a pulpal polyp protruding from a large exposure site! This tooth has been vital for 10 months. I'm convinced this may be the most gentle modality for removing caries in the dental firmament.

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